WATER RESOURCES REVIEW for

JULY
1976

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

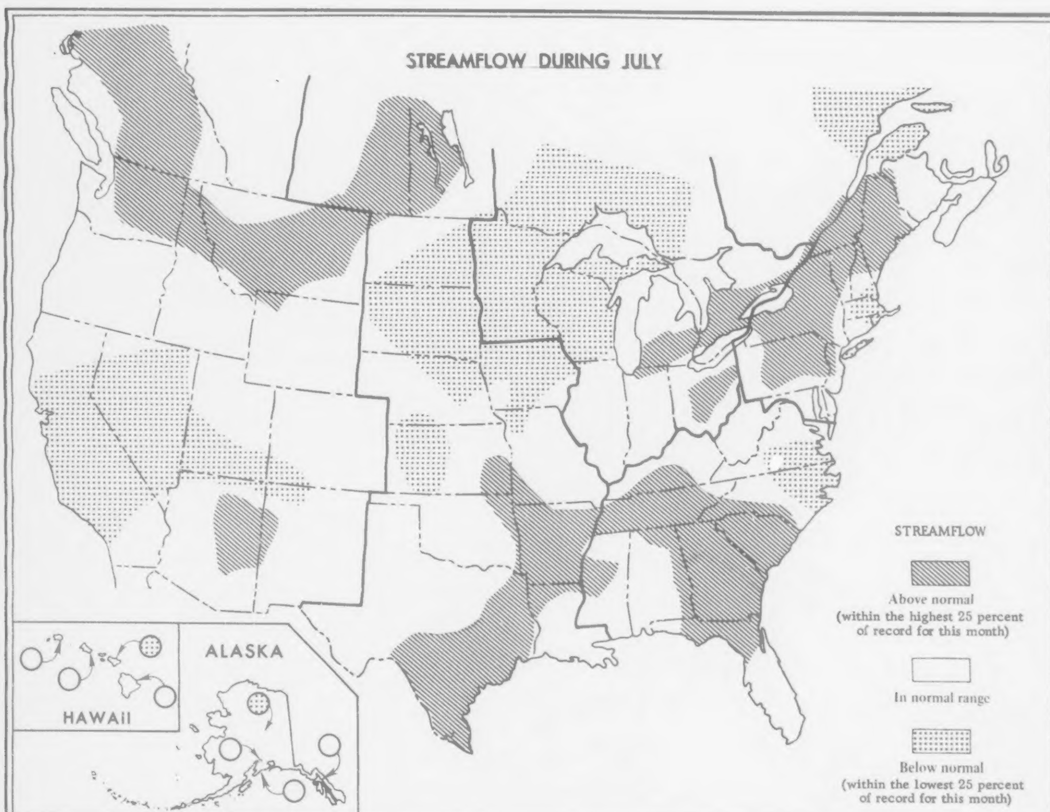
CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

STREAMFLOW AND GROUND-WATER CONDITIONS

Flooding occurred in Colorado, Iowa, Kansas, Missouri, and Oklahoma. Many lives were lost in northern Colorado as a result of the locally severe flood on the Big Thompson River.

Streamflow decreased seasonally in much of the United States but increased in southwestern Canada, as well as in Arizona, and parts of Texas, Oklahoma, Kansas, and some southeastern States.

Below-normal flows persisted in California, Nevada, and Utah, and many midwestern States. Flows remained in the above-normal range in large areas of the East and increased into that range in parts of Arizona, Ohio, and the New England States. Monthly and daily mean flows were lowest of record in parts of California, Michigan, Minnesota, and Alaska.



CONTENTS:

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW REMAINED IN THE ABOVE-NORMAL RANGE IN THE SOUTH-CENTRAL PART OF THE REGION AND INCREASED INTO THAT RANGE IN PARTS OF THE NEW ENGLAND STATES AND SOUTHERN QUEBEC. FLOWS REMAINED IN THE BELOW-NORMAL RANGE IN PARTS OF MASSACHUSETTS, NEW YORK, AND RHODE ISLAND AND DECREASED INTO THAT RANGE IN EASTERN QUEBEC.

In south-central New York, where flooding occurred in parts of Susquehanna River basin in June, high carryover flow held monthly mean discharge of Susquehanna River at Conklin in the above-normal range for the 3d consecutive month. Downstream at Harrisburg, Pa., monthly flow also remained above the normal range. In the adjacent Delaware River basin, monthly mean flow of Delaware River at Trenton, N.J., increased contraseasonally and was above the normal range. In eastern New York, monthly flows of Mohawk River at Cohoes and Hudson River at Hadley remained in the above-normal range where they have been in 8 and 9 months respectively, of the past 10 months.

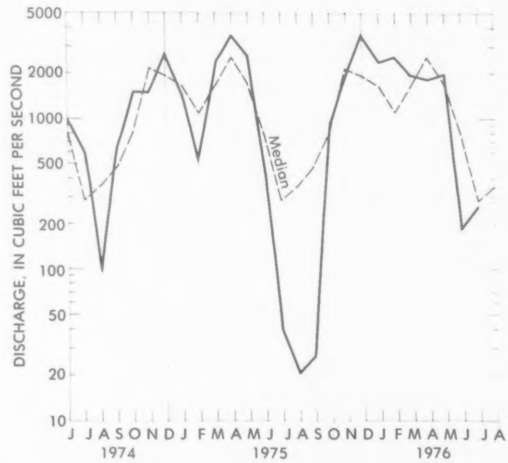
In the adjacent area of central Vermont, monthly mean flow at the index station White River at West Hartford decreased seasonally but was about 3 times median for the month and above the normal range. In the extreme southern part of that State, monthly runoff in Batten Kill at Arlington was highest for July since 1935 and 3d highest for the month since records began in October 1928.

In Maine and the adjacent area of southeastern Quebec, where monthly mean flows normally decrease in July, flows increased into the above-normal range and were about 3 times the July median flows. Similarly, streamflow increased at index stations in New Brunswick and Nova Scotia, but was in the normal range. (See graph of St. Marys River at Stillwater, Nova Scotia.)

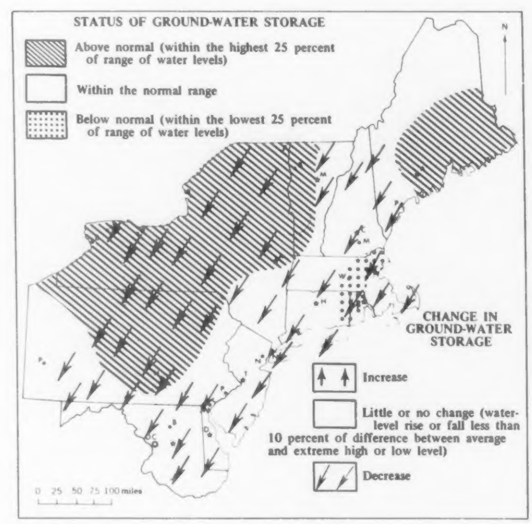
In eastern parts of Quebec, both north and south of St. Lawrence River, and in parts of Massachusetts, Rhode Island, and Long Island, New York, monthly flows were below the normal range and about one-half of median for the month.

Flow in the boundary stream, St. Lawrence River at La Salle, Quebec (near Montreal), decreased seasonally but remained in the above-normal range.

Ground-water levels continued to decline seasonally in most of the region. (See map.) Exceptions included much of Maine as well as smaller areas in northern New Jersey and extreme western New York and Pennsylvania where levels stayed about the same or rose slightly. Levels near monthend remained in the above-normal range in much of Vermont, New York State, and central Pennsylvania; and were above average also in eastern Maine. Levels were below average in parts of Rhode Island and eastern Massachusetts.



Monthly mean discharge of St. Marys River at Stillwater, Nova Scotia (Drainage area, 523 sq mi; 1,355 sq km)



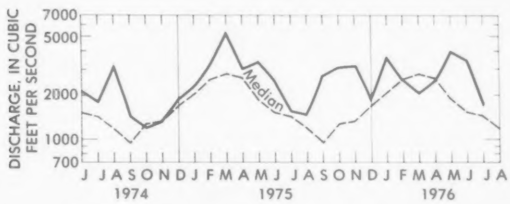
Map shows ground-water storage near end of July and change in ground-water storage from end of June to end of July.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW GENERALLY DECREASED SEASONALLY BUT REMAINED ABOVE THE NORMAL RANGE IN A LARGE AREA IN THE CENTRAL AND SOUTHEASTERN PARTS OF THE REGION. FLOWS DECREASED INTO THE BELOW-NORMAL RANGE IN PARTS OF NORTH CAROLINA AND VIRGINIA.

High carryover flows from June, augmented by runoff from July thunderstorms, held monthly mean discharge in the above-normal range in parts of Florida, Georgia, Kentucky, North Carolina, South Carolina, and Tennessee. In western North Carolina, mean flow of French Broad River at Asheville decreased seasonally but remained above the normal range for the 3d consecutive month. (See graph.) In the adjacent area of eastern



Monthly mean discharge of French Broad River at Asheville, N.C. (Drainage area, 945 sq mi; 2,448 sq km)

Tennessee, monthly mean discharge of Emory River at Oakdale also decreased seasonally but was 5 times the median flow for July and remained above the normal range. In eastern South Carolina, monthly mean flow in Lynches River at Effingham also remained in the above-normal range and was 3 times median.

In southeastern Georgia and the adjacent area of Florida, flows decreased contraseasonally but were about 2 times the July medians and were in the above-normal range.

In the northeastern part of the region, monthly mean flows of Nottaway River near Stony Creek in southeastern Virginia, and Neuse River near Clayton in the adjacent area of North Carolina, decreased into the below-normal range and were only one-third of the July median flows for those sites.

Ground-water levels declined in most of the region. The few exceptions included slight rises in wells in parts of northern and central Florida and in the Piedmont of Georgia, and rising levels also in the northern one-third of West Virginia. In the heavily pumped Brunswick and Savannah areas of coastal Georgia, levels stayed about the same or declined slightly. Monthend levels were generally above average in Kentucky, northern West Virginia, and in the Piedmont and mountains of North Carolina. Levels were below average in southern West Virginia, in the Coastal Plain of North Carolina, and in southeastern Florida.

WESTERN GREAT LAKES REGION

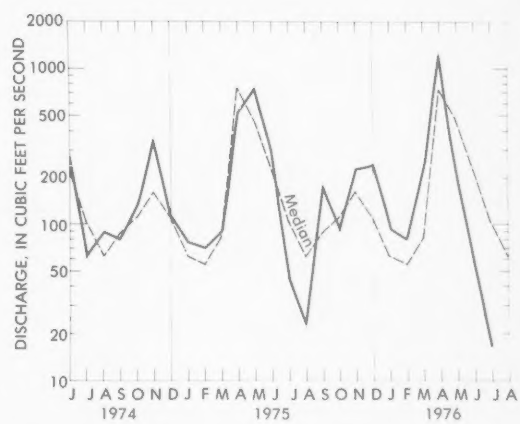
[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW DECREASED SEASONALLY IN MOST PARTS OF THE REGION BUT INCREASED IN SOUTHERN PARTS OF INDIANA AND OHIO. MONTHLY MEAN FLOWS REMAINED BELOW THE NORMAL RANGE AT SOME OR ALL INDEX STATIONS IN EACH STATE AND PROVINCE IN THE REGION, EXCEPT INDIANA AND OHIO, AND WERE LOWEST OF RECORD FOR THE MONTH IN PARTS OF MICHIGAN AND MINNESOTA.

In central Minnesota, the monthly mean discharge of 67.4 cfs in Crow River at Rockford (drainage area, 2,520 square miles) was lowest for July in 51 years of record and was only 10 percent of median. In the western part of the State, the mean discharge of 10.4 cfs in Buffalo Creek near Dilworth (drainage area, 1,040 square miles) was lowest for July in 45 years of record and 13 percent of the July median flow.

In Wisconsin, flows remained below the normal range at all index stations and generally were about one-half of median for the month. In the central part of the State, the mean flow of 3,719 cfs in Wisconsin River at Muscoda (drainage area, 10,300 square miles) was 3d lowest for the month in 63 years of record. In northwestern Wisconsin, mean flow of Jump River at Sheldon remained in the below-normal range for the 3d consecutive month and was only 21 percent of median.

In the Upper Peninsula of Michigan, the monthly mean discharge of 16.3 cfs at the index station, Sturgeon River near Sidnaw (drainage area, 171 square miles) was only 16 percent of median and lowest for July in 36 years of record. (See graph.)



Monthly mean discharge of Sturgeon River near Sidnaw, Mich. (Drainage area, 171 sq mi; 443 sq km)

In southern Ontario, mean flows in English River at Umfreville and Missinaibi River at Mattice remained in the below-normal range and were about one-half of median for July. In extreme southeastern Ontario, monthly mean discharge in Saugeen River near Port Elgin increased contraseasonally, from less than median in June to 2 times median flow in July. Similarly, in the adjacent area of southern Michigan, the monthly mean flow of Red Cedar River at East Lansing increased and was 2 times median.

In eastern Ohio, flow of Little Beaver Creek near East Liverpool increased sharply as a result of runoff from rains near midmonth and the monthly mean flow was about 6 times median. In the adjacent basin of Mahoning River, runoff from intense rainfall on July 11 resulted in a peak discharge of 1,500 cfs in Hinckley Creek at Charlestown (drainage area, 7.85 square miles), gage height, 13.7 feet, reported by local residents to be the highest stage at this site since 1959. In central Ohio, flow of Scioto River at Higby increased contraseasonally and was about 2 times the median discharge for July. Streamflow increased also in southern parts of Indiana and Illinois, but monthly mean discharges were in the normal range.

Ground-water levels fell in most areas, but rose slightly in northeastern Ohio. Monthend levels remained

Provisional data: subject to revision

Selected data for the Great Lakes, Great Salt Lake, and other hydrologic sites.

Great Lakes levels

Water levels are expressed as elevations in feet above International Great Lakes Datum 1955 (= Chart Datum = mean water level at Father Point, Quebec).*

Lake	July 31, 1976	Monthly mean, July 1976	Monthly mean, July 1975	July average, 1900–75	July maximum (year)	July minimum (year)
Superior (Marquette, Mich.)	601.30	601.25	601.54	600.89	601.89 (1950)	598.99 (1926)
Michigan and Huron (Harbor Beach, Mich.)	580.45	580.50	580.49	578.68	581.04 (1974)	575.96 (1964)
St. Clair (St. Clair Shores, Mich.)	575.70	575.72	575.57	573.84	576.20 (1973)	571.88 (1934)
Erie (Cleveland, Ohio)	572.70	572.77	572.58	570.92	573.34 (1973)	568.46 (1934)
Ontario (Oswego, N.Y.)	246.65	246.94	245.50	245.47	247.74 (1947)	242.75 (1934)

Great Salt Lake

Alltime high: 4,211.6 (1873). Alltime low: 4,191.35 (October 1963).	July 31, 1976	July 31, 1975	July average, 1904–75	July maximum (year)	July minimum (year)
Elevation (add 4,000 to data at right) in feet above mean sea level:	201.25	201.15	198.4	204.4 (1923)	192.15 (1963)

Florida

Site	July 1976		June 1976	July 1975
	Discharge, in cfs	Percent of normal	Discharge in cfs	Discharge in cfs
Silver Springs near Ocala (northern Florida)	760	100	660	640
Miami Canal at Miami (southeastern Florida)	171	58	428	172
Tamiami Canal outlets, 40-mile bend to Monroe	426	166	405	273

*Data furnished by National Ocean Survey, NOAA, via U.S. Army Corps of Engineers office in Detroit. To convert data to elevations above mean sea level (datum of 1929), add the following values: Superior, 0.96; Michigan-Huron, 1.20; St. Clair, 1.24; Erie, 1.57; Ontario, 1.22.

above average in Michigan, were near or slightly above average in central and northeastern Ohio, were near average in Wisconsin, and were below average in shallow wells in Minnesota. Levels were also below average in artesian aquifers in the Minneapolis-St. Paul, Minn., area, continuing to fall both in the Prairie du Chien aquifer and in the deeper Mt. Simon-Hinckley aquifer.

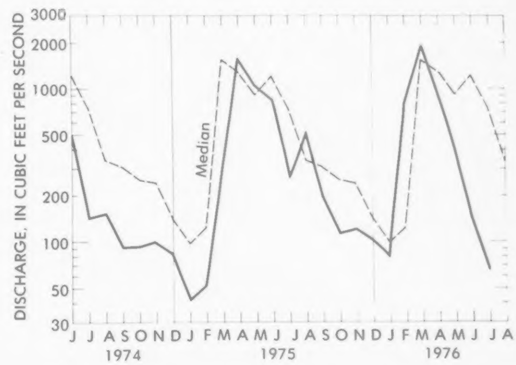
MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW INCREASED UNSEASONALLY IN PARTS OF KANSAS, LOUISIANA, AND TEXAS, AND DECREASED SEASONALLY ELSEWHERE IN THE REGION. FLOWS REMAINED BELOW THE NORMAL RANGE IN PARTS OF IOWA, KANSAS, MISSOURI, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA, AND TEXAS, AND ABOVE THAT RANGE IN PARTS OF ARKANSAS AND LOUISIANA. FLOODING OCCURRED IN IOWA, KANSAS, MISSOURI, AND OKLAHOMA.

Major flooding occurred along some tributary streams in Arkansas River basin in southeastern Kansas and the adjacent area of southwestern Missouri as a result of rapid runoff from rains of as much as 12 inches July 2, 3. Peak discharges at several gaging stations were highest of record and greater than the discharge of a 100-year flood. Data on stages, discharges, and gaging-station locations of selected measurement sites are given on the table and map on page 6. In extreme northeastern Oklahoma, flooding occurred along Spring River, also in Arkansas River basin, and the peak discharge of 110,000 cfs July 3 near Quapaw was the 2d highest since 1939 and was equal to the discharge of a 25-year flood at that site. Also in northeastern Oklahoma, severe flooding occurred July 4 in the city of Pryor causing damage reported to be in excess of one million dollars. This was the second major flood event in Pryor within the past 10 months. Minor flooding occurred near midmonth along small streams in south-central and southeastern Iowa.

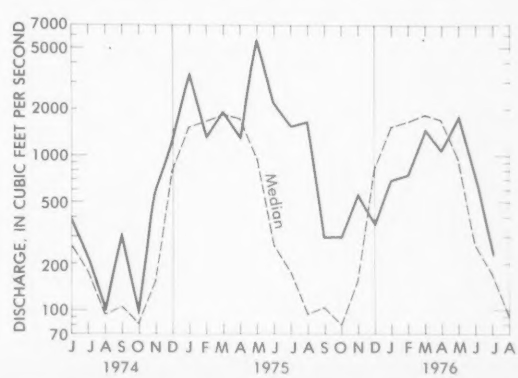
Below-normal flows persisted in much of the region and monthly mean discharges were less than 20 percent of median in some streams in Iowa, Missouri, Nebraska, and South Dakota. For example, the monthly mean discharge of 196 cfs in Elkhorn River at Waterloo, in eastern Nebraska, was only 19 percent of median but was 11 percent greater than the minimum July monthly mean discharge of 177 cfs that occurred in 1936. In eastern South Dakota and the adjacent areas of Minnesota and Iowa, the monthly-mean discharge 66.5 cfs in Big Sioux River at Akron, Iowa, was only 9 percent of the July median but was 31 percent greater than the minimum July mean of 50.7 cfs observed in 1931. (See graph.) In eastern North Dakota, monthly



Monthly mean discharge of Big Sioux River at Akron, Iowa (Drainage area, 9,030 sq mi; 23,390 sq km)

mean flow of Red River of the North at Grand Forks continued to decrease seasonally and was only 41 percent of median. In the southern part of that State, flow of Cannonball River at Breien decreased into the below-normal range and was only one-third of median but was 5 times the minimum July mean of record. In northwestern Missouri and the adjacent area of Iowa, monthly mean flow of Grand River, as measured at Gallatin, Missouri, was only 11 percent of median for July but was 4 times the minimum July mean discharge of record.

In the southern part of the region, streamflow increased into the above-normal range in some coastal basins in Texas and also in parts of northern Louisiana. Monthly mean discharges were as much as 8 times the median discharge in those areas. In central Louisiana, flow in Calcasieu River near Oberlin continued to decrease seasonally but remained above median. (See graph.) In Arkansas, high carryover flows from June,

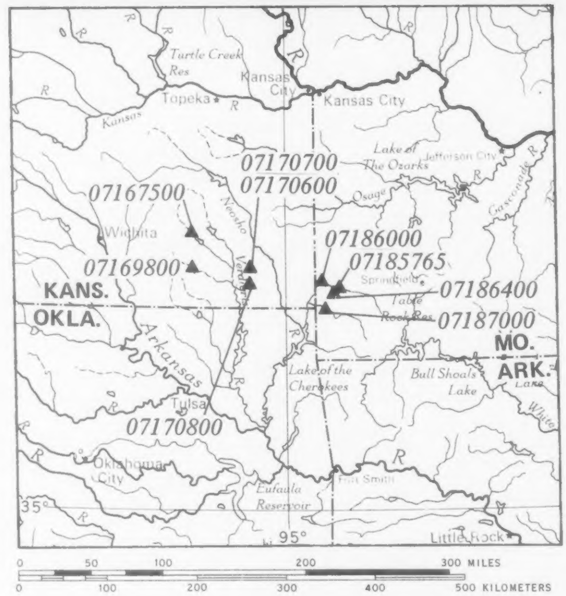


Monthly mean discharge of Calcasieu River near Oberlin, La. (Drainage area, 753 sq mi; 1,950 sq km)

augmented by runoff from several showers during July, held monthly mean discharge at the index stations in the above-normal range. Flow in Saline River near Rye, in the southern part of that State, was 8 times the July median flow.

In the northern part of the region, flows continued to decrease seasonally in Manitoba and Saskatchewan but high carryover flow from June held monthly mean discharge of Qu'Appelle River near Lumsden, Saskatchewan, in the above-normal range where it has been in 3 of the past 4 months.

Ground-water levels declined seasonally in North Dakota, remaining below average in the southeastern part. Levels in shallow observation wells in Iowa also declined except for one well in the southwest corner; levels were generally above average except for two wells in the northeastern part of the State. In Nebraska, levels were near long-term averages except where large amounts of ground water were pumped for irrigation and municipal use; monthend levels were below those of June and, except in the northeastern part of the State, were below the levels of last year. Levels declined in the Lawrence area in Kansas, declined moderately in the



Location of stream-gaging stations in Kansas and Missouri, described in table of peak stages and discharges.

Provisional data; subject to revision

STAGES AND DISCHARGES FOR THE FLOODS OF JULY 1976 AT SELECTED SITES IN KANSAS AND MISSOURI

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known: Date	Stage (feet)	Discharge (cfs)	Maximum during present flood: Date	Stage (feet)	Discharge: Cfs	Cfs per square mile	Recurrence interval (years)
KANSAS											
ARKANSAS RIVER BASIN											
07167500	Otter Creek at Climax....	129	1946–	Sept. 13, 1961	28.50	44,000	July 3	31.42	70,000	543	[a]1.5
07169800	Elk River at Elk Falls....	220	1967–	Apr. 18, 1970	27.48	29,300	3	34.82	59,000	268	[a]1.4
07170600	Cherry Creek near Cherryvale.	15.0	1957–	Mar. 10, 1974	20.82	5,600	2 or 3 3	26.26	10,000	667	[a]1.5
07170700	Big Hill Creek near Cherryvale.	37.0	[b]1957–	Mar. 10, 1974	19.87	13,000	3	23.09	28,000	757	[a]1.6
07170800	Mud Creek near Mound Valley.	4.22	1957–	May 16, 1957	18.08	3,200	2 or 3	21.4	7,500	1,777	[a]2.4
MISSOURI											
ARKANSAS RIVER BASIN											
07185765	Spring River at Carthage.	425	1966–	Nov. 1, 1972	17.15	24,800	July 3	14.00	11,600	27	<5
07186000	Spring River near Waco...	1,164	1924–	May 19, 1943	30.94	103,000	3	25.35	44,200	38	15
07186400	Center Creek near Carterville.	232	[c]1962–	Nov. 1, 1972	15.94	22,500	3	17.68	36,300	156	>50
07187000	Shoal Creek above Joplin.	427	1924–	May 18, 1943	16.8	62,100	3	16.43	18,100	42	5

[a] Ratio of discharge to that of a 100-year flood.
[b] Flood in 1951 reached a stage of 18.92 ft.
[c] Flood in 1959 reached a stage of 18.57 ft.

Colby area, but rose in the Wichita area. In the rice-growing area of east-central Arkansas, levels in the shallow aquifer declined one-half foot but remained near average; in the industrial aquifer of central and southern Arkansas (the Sparta Sand), the level declined nearly 3 feet at Pine Bluff and was below average, and at El Dorado declined about 1 foot but was above average. Levels declined in most major aquifers in Louisiana, except in the Chicot aquifer in the southwestern part where water levels rose because of decreased pumping for rice irrigation. In Texas, levels were above average in the Edwards Limestone at Austin and San Antonio, and below average in the Evangeline aquifer at Houston and in the bolson deposits at El Paso. Water levels rose at Austin, San Antonio, and El Paso, but declined at Houston. New July lows were recorded at Houston and El Paso. A new alltime low was recorded in the Ogallala Formation at Plainview.

WEST

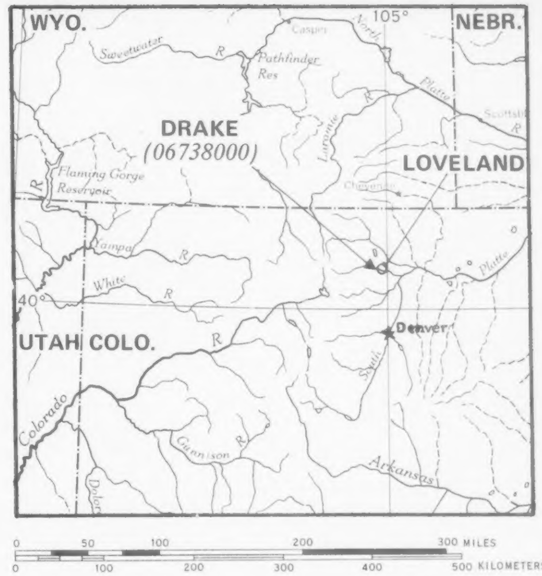
[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW DECREASED SEASONALLY IN MOST OF THE REGION BUT INCREASED IN ALBERTA, BRITISH COLUMBIA, ARIZONA, AND PARTS OF NEW MEXICO. FLOWS REMAINED BELOW THE NORMAL RANGE IN MOST OF CALIFORNIA, NEVADA, AND PARTS OF UTAH, WHEREAS ABOVE-NORMAL FLOWS OCCURRED IN BRITISH COLUMBIA, WASHINGTON, IDAHO, AND MONTANA. LOCALLY CATASTROPHIC FLOODING OCCURRED ON BIG THOMPSON RIVER IN NORTHERN COLORADO AT MONTHEND, TAKING A HEAVY TOLL OF LIVES.

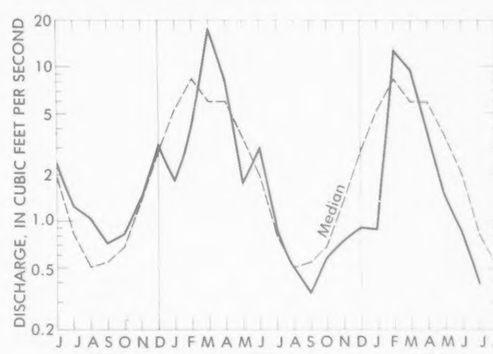
Major flooding on the Big Thompson River basin in Colorado occurred on July 31 when as much as 10 inches of rain fell on the basin in less than 4 hours. The Big Thompson River near Drake, at the mouth of the canyon (drainage area, 304 square miles), crested at 11 p.m. at a discharge estimated at 40,000 cfs (gage height 19.0 ft). This discharge is 2.4 times that of a 100-year flood at this site. Previous maximum at Drake was 7,600 cfs, July 19, 1945 (gage height, 9.00 ft). The gaging station and cableway at Drake (location shown on accompanying map) were destroyed and several miles of Highway 34, in the canyon west of Loveland, Colorado, was reduced to rubble. Scores of lives were lost.

In California, monthly mean flows were below the normal range except for the extreme north-coastal area and part of southern California, which were slightly below median. The runoff of the North Fork American River at North Fork Dam (drainage area, 342 square miles) was only 26 percent of median and in the below-normal range for the 7th consecutive month. In the south-central part of the State, monthly mean flow of 293 cfs at Kings River above North Fork was only 21 percent of median, in the below-normal range, and record low for July. By contrast, flow at the index station, Arroyo Seco near Pasadena, was 50 percent of median and in the normal range. (See graph.) Water shortages in those areas of the State without substantial surface- or ground-water storage continued to worsen as expected, although, along the coast, early morning fog helped to reduce the fire hazard.

In eastern Washington, British Columbia, and northern Idaho, monthly mean discharge at the index stations



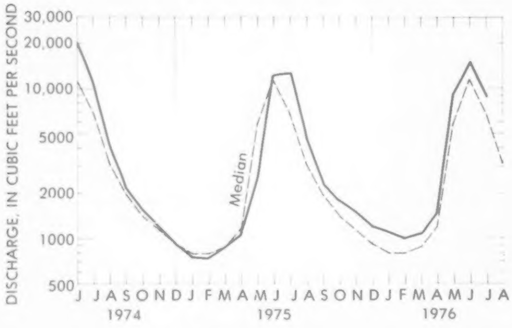
Location of Big Thompson River flood.



Monthly mean discharge of Arroyo Seco near Pasadena, Calif. (Drainage area, 16.0 sq mi; 41.4 sq km)

were in the above-normal range as a result of scattered thunderstorms and snowmelt runoff.

In Montana, flows were generally in the above-normal range except in the Marias and Middle Fork Flathead River basins where runoff was in the normal range. Monthly mean discharge at the index station, Yellowstone River at Corwin Springs, was above the normal range for the 3d consecutive month and for the 9th time in the past 10 months. (See graph.)



Monthly mean discharge of Yellowstone River at Corwin Springs, Mont. (Drainage area, 2,623 sq mi; 6,794 sq km)

In Arizona, streamflow generally increased seasonally and was above the normal range in the San Pedro and Little Colorado River basins.

Storage in major reservoirs was much below average in California, near average in southern Idaho and Washington, and above average in northern Idaho. The net decrease in storage in the Colorado River Storage Project was 259,040 acre-feet during the month.

Ground-water levels generally rose in Utah (except at Holladay in the north-central part of State) and in Idaho in the north (Rathdrum Prairie) and southwest (Meridian and Gooding). Levels fluctuated only slightly in most of southern New Mexico, except in the Pecos Valley where the level in the key well fell nearly 5 feet. Levels declined in much of Nevada and Montana, and also at Atomic City in eastern Idaho. Levels near monthend were above average in Montana, in much of Idaho, in western Washington, in north-central and east-central Nevada (at Paradise and Steptoe, respectively), and in extreme northern and southeastern Utah (at Logan and Blanding, respectively). Levels were generally below average in eastern Washington, most of Utah, southern California, and in southern New Mexico and Arizona. In southern Arizona, lowest levels of record for July were observed in four of seven key wells.

ALASKA

Streamflow increased seasonally in south-central and southeastern coastal basins and in Tanana River basin in east-central Alaska, and generally decreased seasonally elsewhere in the State. Low carryover flow from June and lack of runoff from precipitation and snowmelt in July held monthly mean flows of Tanana River at Nenana and Chena River at Fairbanks in the below-normal range. The mean discharge of 47,430 cfs at Nenana (drainage area, 25,600 square miles) was lowest for July since records began at that site in 1963. At Fairbanks (drainage area, 1,980 square miles), the monthly mean discharge of 658 cfs, and the daily mean of 500 cfs on July 15, were lowest for the month in record that began in 1949.

Ground-water levels in most of the Anchorage area rose 1 to 3 feet in confined aquifers, but declined to lowest levels of record in the southern part of the city as a result of new increases in pumping. Near Kenai, levels in water-table and confined aquifers declined less than one foot in areas not affected by pumping.

HAWAII

Streamflow increased seasonally at the index stations on the islands of Kauai and Oahu and was in the normal range. On the island of Maui, monthly mean flow also increased seasonally at the index station, Honopou Stream near Huelo, but remained below the normal range and was only one-third of the median flow for July, as a result of low carryover flow from June. On the island of Hawaii, flow of Waiakea Stream near Mountain View decreased seasonally and was less than median but was within the normal range.

SOME RECENT GEOLOGICAL SURVEY REPORTS ON WATER RESOURCES AND OTHER SUBJECTS

NOTE: Copies of these reports may be purchased at the prices shown by check or money order payable in advance to U.S. Geological Survey (Branch of Distribution, U.S. Geological Survey, 1200 South Eads St., Arlington, VA 22202). In ordering books and maps, give the series designation and number, such as Geological Survey Professional Paper 521-F or Miscellaneous Investigations Series Map I-853-D, *and* the full title.

Artificial recharge through a well in fissured carbonate rock, West St. Paul, Minnesota, by H. O. Reeder, W. W. Wood, G. G. Ehrlich, and R. J. Sun: U.S. Geological Survey Water-Supply Paper 2004. 1976. 80 pages. $1.65.

Boundaries of the United States and the several States, by F. K. Van Zandt: U.S. Geological Survey Professional Paper 909. 1975. 191 pages. $5.20.

Flow from small watersheds adjacent to the study reach of the Gila River Phreatophyte Project, Arizona, by D. E. Burkham: U.S. Geological Survey Professional Paper 655–I. 1976. Pages I1–I19; plates in pocket. 55c.

(Continued on page 11.)

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JULY 1976

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of June 1976	End of July 1976	End of July 1975	Average for end of July	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	78	74	57	60	223,400 (a)
QUEBEC					
Allard (P)	83	88	88	117	280,600 ac-ft
Gouin (P)	82	84	75	102	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	94	92	81	78	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	91	86	94	89	3,330 mcf
Lake Francis (FPR)	65	79	73	87	4,326 mcf
Lake Winnipesaukee (PR)	102	95	97	87	7,200 mcf
VERMONT					
Harriman (P)	78	78	83	78	5,060 mcf
Somerset (P)	61	88	92	83	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	79	83	89	83	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	95	89	82	82	34,270 mcf
Indian Lake (FMP)	106	100	104	90	4,500 mcf
New York City reservoir system (MW)	96	93	97	......	547,500 mg
NEW JERSEY					
Wanaque (M)	93	95	101	81	27,730 mg
PENNSYLVANIA					
Allegheny (FPR)	49	48	47	43	51,400 mcf
Pymatuning (FMR)	93	91	95	93	8,191 mcf
Raystown Lake (FR)	68	67	66	48	33,190 mcf
Lake Wallenpaupack (PR)	86	75	73	73	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	100	98	100	90	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	96	94	93	89	12,580 mcf
Narrows (Badin Lake) (P)	97	97	97	99	5,617 mcf
High Rock Lake (P)	96	82	97	76	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	95	92	93	75	70,300 mcf
Lakes Marion and Moultrie (P)	94	85	93	72	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	83	80	77	70	75,360 mcf
GEORGIA					
Burton (PR)	99	94	95	90	104,000 ac-ft
Sinclair (MPR)	93	84	95	91	214,000 ac-ft
Lake Sidney Lanier (FMPR)	66	64	65	62	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	105	96	100	89	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	60	56	54	56	1,156,000 cfsd
Douglas Lake (FPR)	87	73	43	60	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	95	90	68	76	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	68	63	62	62	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	95	90	61	77	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	91	79	85	84	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	70	51	66	74	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	27	25	49	39	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	95	98	107	......	22,640,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	82	72	79	86	127,600 ac-ft
Bell Fourche (I)	79	50	68	56	185,200 ac-ft
Lake Francis Case (FIP)	74	78	85	82	4,834,000 ac-ft
Lake Oahe (FIP)	87	86	99	......	22,530,000 ac-ft
MIDCONTINENT REGION—Continued					
SOUTH DAKOTA--Continued					
Lake Sharpe (FIP)	102	103	102	99	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	87	92	94	95	477,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	80	69	79	74	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	94	88	98	84	2,378,000 ac-ft
Keystone (FPR)	86	102	99	93	661,000 ac-ft
Tenkiller Ferry (FPR)	102	101	103	94	628,200 ac-ft
Lake Altus (FIMR)	99	82	100	60	134,500 ac-ft
Lake O'The Cherokees (FPR)	103	94	94	90	1,492,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	101	99	105	97	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	90	90	100	46	386,400 ac-ft
Canyon (FMR)	95	100	99	63	385,600 ac-ft
International Amistad (FIMPW)	99	100	100	60	3,497,000 ac-ft
International Falcon (FIMPW)	87	100	100	63	2,667,000 ac-ft
Livingston (IMW)	100	100	100	72	1,788,000 ac-ft
Possum Kingdom (IMPRW)	91	92	97	105	569,400 ac-ft
Red Bluff (PI)	27	25	45	24	307,000 ac-ft
Toledo Bend (P)	100	100	98	84	4,472,000 ac-ft
Twin Buttes (FIM)	94	92	98	7	177,800 ac-ft
Lake Kemp (IMW)	77	71	70	92	268,000 ac-ft
Lake Meredith (FMW)	39	38	50	40	821,300 ac-ft
Lake Travis (FIMPRW)	96	100	98	76	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	89	99	100	96	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	93	97	97	94	5,232,000 ac-ft
Lake Chelan (PR)	95	97	100	99	676,100 ac-ft
Lake Cushman	99	103	102	99	359,500 ac-ft
Lake Merwin (P)	104	106	106	105	246,000 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	91	75	84	77	1,235,000 ac-ft
Coeur d'Alene Lake (P)	100	99	100	79	238,500 ac-ft
Pend Oreille Lake (FP)	98	100	99	94	1,561,000 ac-ft
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	77	68	85	73	4,401,000 ac-ft
WYOMING					
Boysen (FIP)	75	86	100	90	802,000 ac-ft
Buffalo Bill (IP)	80	103	102	102	421,300 ac-ft
Keyhole (F)	76	75	78	45	199,900 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	79	71	77	55	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	20	364,400 ac-ft
Taylor Park (IR)	85	81	101	92	106,200 ac-ft
Colorado–Big Thompson project (I)	79	68	91	74	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	84	83	87	......	31,280,000 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	92	89	95	66	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	59	53	87	81	1,000,000 ac-ft
Hetch Hetchy (MP)	57	50	98	78	360,400 ac-ft
Isabella (FIR)	26	17	52	40	551,800 ac-ft
Pine Flat (FI)	47	27	62	54	1,014,000 ac-ft
Clair Engle Lake (Lewiston) (P)	83	76	95	89	2,438,000 ac-ft
Lake Almanor (P)	59	59	97	60	1,036,000 ac-ft
Lake Berryessa (FIMW)	74	70	92	84	1,600,000 ac-ft
Millerton Lake (FI)	69	49	61	65	503,200 ac-ft
Shasta Lake (FIPR)	51	39	94	82	4,377,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	60	54	91	72	744,600 ac-ft
NEVADA					
Rye Patch (I)	84	76	108	......	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	78	78	76	72	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	4	2	12	12	1,093,000 ac-ft
Salt and Verde River system (IMPR)	61	56	61	39	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	23	27	30	78	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	20	18	23	26	2,539,000 ac-ft

[a]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage)

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR JULY AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	July data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month		
			Mean (cfs)	Minimum (mg/l)	Maximum (mg/l)	Mean (tons per day)	Minimum (tons per day)	Maximum (tons per day)	Mean, in °C	Mini-mum, in °C	Maxi-mum, in °C
	NORTHEAST										
01463500	Delaware River at Trenton, N.J.	1976*	8,770	....	....	......	....	....	24.5 (76°F)	22.5 (72°F)	26.5 (80°F)
	(Morrisville, Pa.)	1945–75	7,442 [5,066[b]]	57 (July 11–20, 1947)	143 (July 7, 1965)	......	465 (July 10, 1965)	16,700 (July 29, 1969)	.....	18.5 (66°F)	33.5 (92°F)
04264331	St. Lawrence River at Cornwall, Ontario, near	1976	350,000	166	167	157,000	153,000	158,000	19.5 (67°F)	18.5 (66°F)	20.0 (68°F)
	Massena, N.Y. (streamflow station formerly at Ogdensburg, N.Y.)	1966–75	279,900 [256,600[b]]	....	....	......	....	....	20.0 (68°F)	15.5 (60°F)	24.0 (75°F)
	SOUTHEAST										
07289000	Mississippi River at Vicksburg, Miss	1976	454,100 [456,600[b]]	232	270	309,000	224,000	383,000	28.0 (82°F)	23.5 (74°F)	30.5 (87°F)
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam 53, near Grand Chain, Ill.	1976	191,600	137	210	......	56,000	126,000	.....	24.5 (76°F)	28.5 (83°F)
	(25 miles west of Paducah, Ky.; streamflow station at Metropolis, Ill.)	1955–75,	154,900 [130,200[b]]	124 (July 4, 1965; July 1, 1967)	276 (July 29, 1968)	......	25,000 (July 27, 1966)	237,000 (July 29, 1958)	.....	16.5 (62°F)	31.0 (88°F)
	MIDCONTINENT										
06934500	Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.)	1976	59,400 [79,360[b]]	298	386	56,400	50,000	75,900	27.5 (82°F)	25.0 (77°F)	30.0 (86°F)
	WEST										
14128910	Columbia River at Warrendale, Oreg.	1976	238,500	60	71	43,200	33,900	54,700	18.0 (64°F)	16.0 (61°F)	20.0 (68°F)
	(30 miles east of Portland, Oreg.; streamflow station at The Dalles, Oreg.)	1968–74	240,400 [275,900[b]]	....	....	......	....	....	.....	15.0 (59°F)	21.5 (71°F)

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]Median of monthly values for 30-year reference period, water years 1941–70, for comparison with data for current month.
*Dissolved-solids monitoring station temporarily out of operation (July 1976).

SOME RECENT GEOLOGICAL SURVEY REPORTS ON WATER RESOURCES AND OTHER SUBJECTS

Continued from page 8.

Hydraulic effects of changes in bottom-land vegetation on three major floods, Gila River, in southeastern Arizona, by D. E. Burkham: U.S. Geological Survey Professional Paper 655–J. 1976. Pages J1–J14; plates in pocket. $2.05.

Hydrology and sedimentation of Bixler Run basin, central Pennsylvania, by L. A. Reed: U.S. Geological Survey Water-Supply Paper 1798–N. 1976. Pages N1–N20. $1.10.

A land use and land cover classification system for use with remote sensor data, by J. R. Anderson, E. E. Hardy, J. T. Roach, and R. E. Witmer: U.S. Geological Survey Professional Paper 964. 1976. 28 pages. 75c.

Sediment characteristics of streams in the eastern Piedmont and western Coastal Plain regions of North Carolina, by C. E. Simmons: U.S. Geological Survey Water-Supply Paper 1798–O. 1976. Pages O1–O32. $1.40.

Spring flow from pre-Pennsylvanian rocks in the southwestern part of the Navajo Indian Reservation, Arizona, by M. E. Cooley: U.S. Geological Survey Professional Paper 521–F. 1976. Pages F1–F15; plates in pocket. $1.05.

NOTE: For maps listed below that are of areas west of the Mississippi River, including Alaska, Hawaii, and Louisiana (but excluding Minnesota), address mail orders to Denver, Colorado, instead of Arlington, Virginia––Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225.

Geologic conditions related to waste-disposal planning in the southern Hood Canal area, Washington, by R. J. Carson, Mackey Smith, and B. L. Foxworthy: U.S. Geological Survey Miscellaneous Investigations Series Map I-853-D. 1975 (1976). Scale 1:62,500. 75c.

Ground-water levels on Boston peninsula, Massachusetts, by J. E. Cotton and D. F. Delaney: U.S. Geological Survey Hydrologic Investigations Atlas HA-513. 1975 (1976). Four sheets. Scale 1:6,000. $2.50 per set.

Map showing configuration and thickness and potentiometric surface and water quality in the Madison Group, Powder River basin, Wyoming and Montana, by F. A. Swenson, W. R. Miller, W. G. Hodson, and F. N. Visher: U.S. Geological Survey Miscellaneous Investigations Series Map I-847-C. 1976. Two sheets. Scale 1:1,000,000. $1.25 per set.

Preliminary hydrography and historic terminal changes of Columbia Glacier, Alaska, by Austin Post: U.S. Geological Survey Hydrologic Investigations Atlas HA-559. 1975 (1976). Three sheets. Scale 1:10,000. $1.75 per set.

Water resources of the thrust belt of western Wyoming, by G. C. Lines and W. R. Glass: U.S. Geological Survey Hydrologic Investigations Atlas HA-539. 1975 (1976). Three sheets. Scale 1:500,000. $2.00 per set.

Water resources of the Lake of the Woods watershed, north-central Minnesota, by J. O. Helgesen, G. F. Lindholm, and D. W. Ericson: U.S. Geological Survey Hydrologic Investigations Atlas HA-544. 1975 (1976). Two sheets. Scale 1:500,000. $1.75 per set.

Water resources of the Cedar River watershed, southeastern Minnesota, by D. F. Farrell, W. L. Broussard, H. W. Anderson, Jr., and M. F. Hult: U.S. Geological Survey Hydrologic Investigations Atlas HA-552. 1975 (1976). Three sheets. Scale 1:250,000. $1.75 per set.

Water resources of the River Raisin basin, southeastern Michigan, by R. L. Knutilla and W. B. Allen: U.S. Geological Survey Hydrologic Investigations Atlas HA-520. 1975 (1976). Two sheets and 27-page text. Scales 1:125,000 and 1:250,000. $1.75 per set.

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

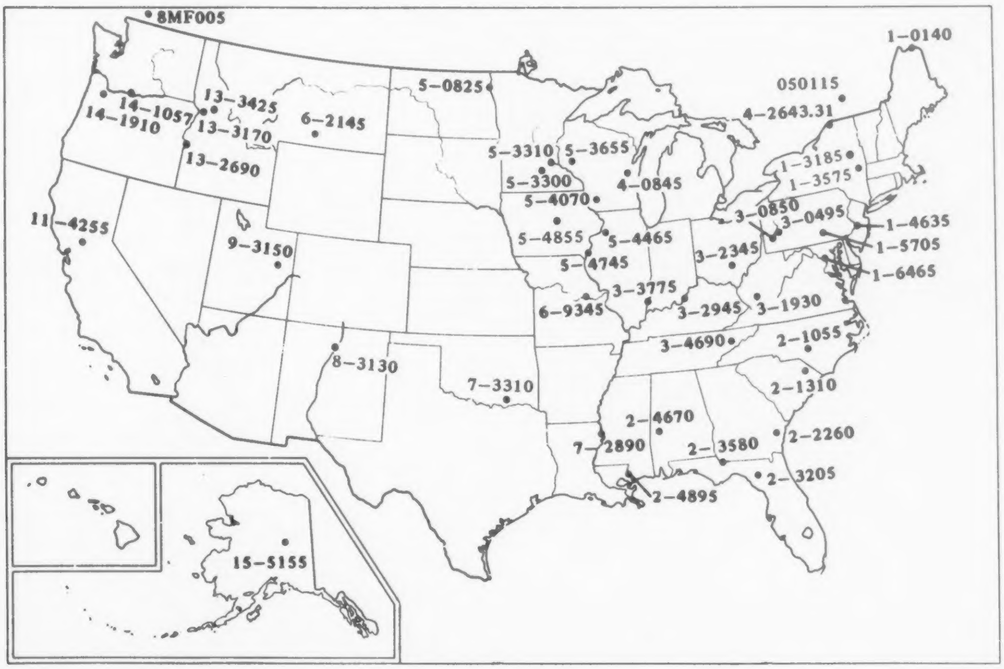
1 foot = 0.3048 meter   1 mile = 1.609 kilometers
1 acre = 0.4047 hectare = 4,047 square meters
1 square mile (sq mi) = 259 hectares = 2.59 square kilometers (sq km)
1 acre-foot (ac-ft) = 1,233 cubic meters
1 million cubic feet (mcf) = 28,320 cubic meters
1 cubic foot per second (cfs) = 0.02832 cubic meters per second = 1.699 cubic meters per minute
1 second-foot-day (cfsd) = 2,447 cubic meters
1 million gallons (mg) = 3,785 cubic meters = 3.785 million liters
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic meters per minute = 3,785 cubic meters per day

FLOW OF LARGE RIVERS DURING JULY 1976

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	July 1976 Monthly dis-charge (cfs)	Percent of median monthly discharge, 1941–70	Change in dis-charge from previous month (percent)	Discharge near end of month (cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	14,630	315	+91	10,000	6,500	30
1–3185	Hudson River at Hadley, N.Y	1,664	2,791	2,930	259	-16	1,700	1,100	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,450	5,480	296	-6	....	......	.....
1–4635	Delaware River at Trenton, N.J	6,780	11,360	8,956	177	+19	5,700	3,680	26
1–5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	21,520	185	-39	9,500	6,100	31
1–6465	Potomac River near Washington, D.C.	11,560	[1] 10,640	4,220	96	-38	3,160	2,040	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	1,369	63	-74	1,700	1,100	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,098	8,220	140	-33	4,680	3,020	29
2–2260	Altamaha River at Doctortown, Ga.	13,600	13,380	10,630	149	-48	7,080	4,580	26
2–3205	Suwannee River at Branford, Fla	7,740	6,775	9,010	180	-32	6,060	3,920	30
2–3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	21,200	136	-28	13,300	8,600	30
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	6,474	110	-47	2,100	1,400	27
2–4895	Pearl River near Bogalusa, La	6,630	8,533	4,287	150	-15	2,810	1,820	31
3–0495	Allegheny River at Natrona, Pa	11,410	[1] 18,700	8,573	143	0	7,650	4,940	29
3–0850	Monongahela River at Braddock, Pa.	7,337	[1] 11,950	5,642	137	+27	3,050	1,970	29
3–1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	6,488	134	-45	6,200	4,010	28
3–2345	Scioto River at Higby, Ohio	5,131	4,337	2,806	178	+13	3,100	2,000	28
3–2945	Ohio River at Louisville, Ky[2]	91,170	110,600	64,600	149	+12	105,000	68,000	27
3–3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	14,650	100	+17	7,090	4,580	31
3–4690	French Broad River below Douglas Dam, Tenn.	4,543	[1] 6,528	5,679	139	-30	....	......	.....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,142	1,570	54	-44	....	......	.....
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	299,000	239,100	350,000	136	0	350,000	226,000	31
050115	St. Maurice River at Grand Mere, Quebec.	16,300	24,900	23,500	109	+5	20,100	13,000	29
5–0825	Red River of the North at Grand Forks, N. Dak.	30,100	2,439	1,192	41	-23	960	620	31
5–3300	Minnesota River near Jordan, Minn ..	16,200	3,306	392	10	-45	312	202	28
5–3310	Mississippi River at St. Paul, Minn ...	36,800	[1] 10,230	2,446	20	-15	1,620	1,050	27
5–3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	1,800	48	+54	....	......	.....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,457	3,719	56	-40	....	......	.....
5–4465	Rock River near Joslin, Ill	9,520	5,288	3,106	89	-33	3,450	2,230	31
5–4745	Mississippi River at Keokuk, Iowa ...	119,000	61,210	27,240	41	-36	41,000	26,000	31
5–4855	Des Moines River below Raccoon River at Des Moines, Iowa.	9,879	3,796	1,334	37	-72	992	641	28
6–2145	Yellowstone River at Billings, Mont.	11,795	6,754	19,750	137	-37	10,400	6,700	31
6–9345	Missouri River at Hermann, Mo	528,200	78,480	59,560	75	-15	57,800	37,400	26
7–2890	Mississippi River at Vicksburg, Miss.[4]	1,144,500	552,700	454,100	99	+4	337,000	218,000	31
7–3310	Washita River near Durwood, Okla ..	7,202	1,379	326	48	-57	225	145	31
8–3130	Rio Grande at Otowi Bridge, near San Ildefonso, N.Mex.	14,300	1,530	656	103	-55	....	......	.....
9–3150	Green River at Green River, Utah ...	40,600	6,369	4,487	70	-66	3,350	2,170	31
11–4255	Sacramento River at Verona, Calif ...	21,257	18,370	11,300	143	+5	12,300	7,950	28
13–2690	Snake River at Weiser, Idaho	69,200	17,670	9,877	91	-59	10,000	6,500	28
13–3170	Salmon River at White Bird, Idaho ..	13,550	11,060	16,360	126	-64	9,730	6,290	28
13–3425	Clearwater River at Spalding, Idaho ..	9,570	15,320	16,390	171	-61	9,900	6,400	28
14–1057	Columbia River at The Dalles, Oreg.[5]	237,000	194,000	238,700	87	-19	....	......	.....
14–1910	Willamette River at Salem, Oreg	7,280	23,370	7,646	107	-37	6,644	4,290	27-31
15–5155	Tanana River at Nenana, Alaska	25,600	24,040	47,430	82	+28	49,200	31,800	31
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	272,000	149	+6	233,000	151,000	30

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge (unadjusted) determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

SELECTED STREAM-GAGING STATIONS ON LARGE RIVERS



Location of stream-gaging stations on large rivers listed in table on page 12.

WATER RESOURCES REVIEW

JULY 1976

Based on reports from the Canadian and U.S. field offices; completed August 5, 1976

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for July based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for July 1976 is compared with flow for July in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for July is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range.* In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the July flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of July. Water level in each key observation well is compared with average level for the end of July determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels,* unless described otherwise, are from the end of June to the end of July.

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EFFECT OF IRRIGATION PUMPING ON DESERT PUPFISH HABITATS IN ASH MEADOWS, NYE COUNTY, NEVADA

The abstract and graphs below are from the report, *Effect of irrigation pumping on desert pupfish habitats in Ash Meadows, Nye County, Nevada,* by W.W. Dudley, Jr., and J.D. Larson: U.S. Geological Survey Professional Paper 927, 52 pages, 1976. The report may be purchased for $1.45 from Branch of Distribution, U.S. Geological Survey, 1200 S. Eads St., Arlington, VA 22202 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 024-001-02825-5), payable to Superintendent of Documents.

ABSTRACT

The Ash Meadows area, at the southern tip of the Amargosa Desert in southern Nevada (fig. 1), discharges ground water collected over several thousand square miles of a regional flow system developed in Paleozoic carbonate rocks. Water moves westward across fault contacts from the bedrock into poorly interconnected gravel, sand, and terrestrial-limestone aquifers in the upper few hundred feet of the basin sediments at Ash Meadows.

A small pool in Devils Hole, which is a collapse depression in Cambrian limestone, and numerous springs in the adjacent desert valley contain rare fish species of the genus *Cyprinodon,* faunal remnants of Pleistocene lakes. The Devils Hole pupfish, *C. diabolis,* is the most endangered of the several surviving species that have evolved since the post-pluvial isolation of their ancestors. This population feeds and reproduces on a slightly submerged rock ledge. Recent irrigation pumping (fig. 1) has nearly exposed this ledge.

Correlation of pumping histories with the stage in Devils Hole allows identification of several wells that affect the pool level most severely. Some springs that are habitats for other species of *Cyprinodon* have reduced discharge because of pumping.

Hydraulic testing, long-term water-level monitoring, water quality, and geologic evidence aid in defining the principal flow paths and hydraulic interconnections in the Ash Meadows area.

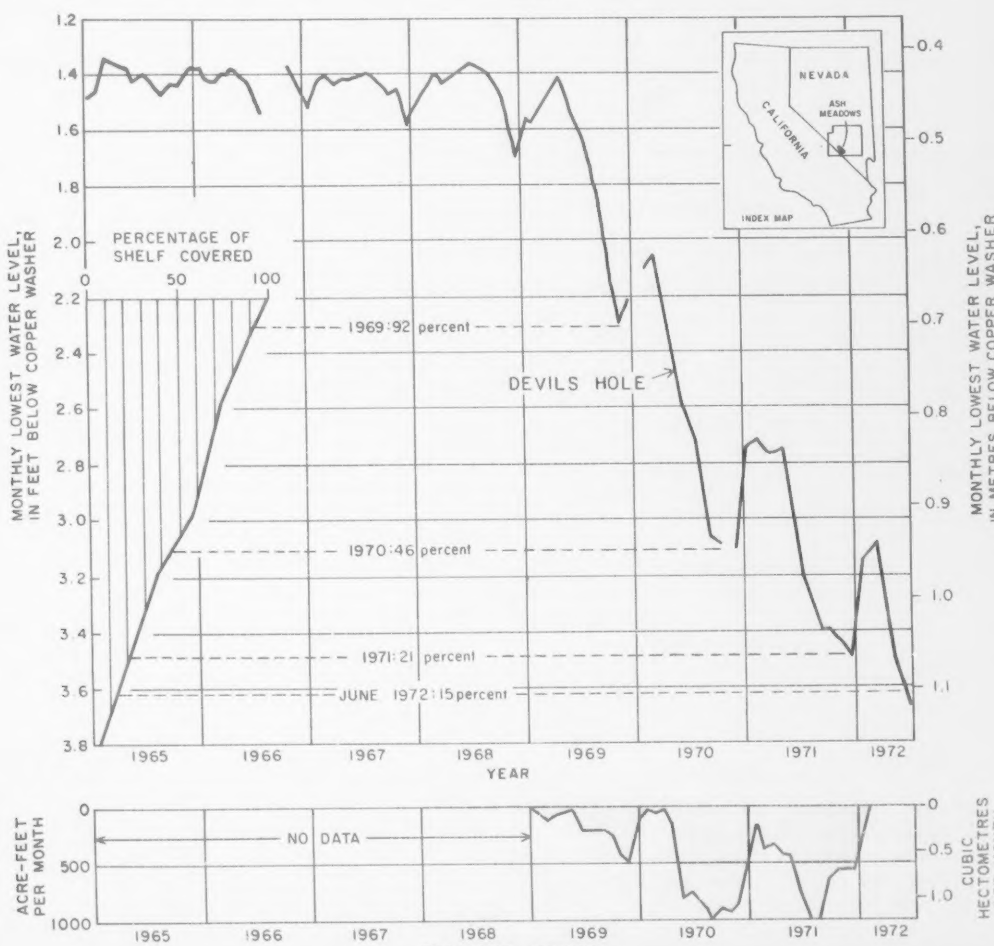

Figure 1.--Monthly lowest water levels in Devils Hole, percentage of natural rock ledge submerged, and estimated pumpage from wells in Ash Meadows, 1965 to mid-1972.

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